

AbstractID: 12834 Title: Physical imaging properties and detectability of simulated microcalcifications of digital magnification mammography with matched incident exposure

Purpose: To improve the image resolution over that obtainable with contact radiography, digital magnification mammographies under the same incident exposure conditions with contact mammography were performed.

Method and Materials: Magnification radiographies of 1.2 - 1.8 times in addition to contact radiography were performed with the same incident exposure in combination with focal spot sizes of 0.1 mm and 0.3 mm, with and without grid techniques. A computed radiography system (FCR PROPECT CS, Fuji Film), including the imaging plate (HR-BD, 50 μ m pixel pitch, Fuji Film), was used in this study. Basic imaging properties, namely; scatter fractions, total modulation transfer functions (MTFs) at object plane and the noise power spectra (NPSs) were measured. Visibilities of contrast-detail mammography (CDMAM) phantom and simulated microcalcification images were evaluated by using a contrast-detail curve and a free-response receiver operating characteristic (FROC) analysis, respectively.

Results: Scatter fractions decreased considerably as the magnification factor increased for the no-grid technique. In the grid technique, scatter fractions for all magnification techniques were comparable. The total MTFs at object plane improved significantly for magnification technique with a combination of 0.1 mm focal spot size compared with conventional contact technique. However, the total MTFs with a combination of 0.3 mm focal spot size slightly improved or were comparable. The NPSs degraded with an increase of the magnification factor compared with contact radiography due to the maintained incident dose to object. Observer performance tests indicated that the magnification techniques using the 0.1 mm focal spot size provided higher detectability than the contact technique.

Conclusion: It is expected that the use of digital magnification mammography under the same incident exposure conditions with contact mammography improved the detectability of microcalcifications.